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Subject:	DEQ preliminary comments on draft FS
Date:	07/27/2012 02:49 PM

Chip, Kristine, Rich, & Susan,

Here are DEQ's preliminary comments on the LWG's 3/12 draft FS. The DEQ team reviewed the draft FS not so much trying to develop line-by-line comments, but rather to develop "big picture" comments & comments that will help us identify portions of the document trying to identify: 1) what parts of the draft FS can be used by EPA if we want to do our own evaluation (e.g., enough cost information, etc)…; 2) what parts are either missing or seriously flawed…; & 3) what parts are fairly close, but need some more LWG input before they're acceptable. We also prepared & attached a series more detailed comments on certain portions of the draft FS.

Big-Picture Comments

1. Overall, the draft FS provides huge amount of very good work that can help us make a CU decision. We recommend using as much of the draft FS as possible to move forward. However, we think there are some deficiencies that either EPA/partners &/or the LWG will need to resolve. One question EPA will need to answer is whether the draft FS has enough information & is as close to the mark as necessary to allow EPA to begin writing the Proposed Plan… or whether EPA will require the LWG to revise & re-submit the document or portions of the document. At this time, DEQ is not certain of what our answer to that question would be.

2. Parts of the draft FS that are missing or seriously flawed:
    a. Appendix E- Sensitivity Analysis (human health)
    b. ARARs- high concentrations Hot Spots

    Both flaws are discussed in the body of this e-mail.

General Comments

1. Models- Does the hydrodynamic model, sediment-transport model, & contaminant-fate model support the LWG's fundamental & very important conclusions regarding long-term sediment contamination trends & MNR? Do we believe natural recovery process will result in reducing essentially all unacceptable risk within 40 years? If so, why do we still see sediment hot-spot areas resulting from old historic releases?

    The LWG's 3 models appear to predict very favorable "natural burial" of surface sediment. EPA and USACE have not completed their detailed review of these models, but preliminarily have expressed concerns that the hydrodynamic & sediment transport models are "uncoupled" (i.e., no feedback from the sediment transport model to the hydrodynamic model) & models may over-predict sediment deposition over time. Such natural recovery leads the LWG to conclude in the FS that all remedial alternatives will achieve RAOs & PRGs over time (see below).

The goal should be that SWACs over an appropriate exposure area achieve RGs (or background) at T=0, or at least close to then, and not at T=30 or 40 years. In other words, rely on active remediation for the majority of cleanup & use MNR to finish the job. Instead, the draft FS appears to rely on MNR for the majority of cleanup.

2. Protection on the correct spatial scale- The LWG focuses on site-wide SWACs to evaluate alternatives. That's OK if the receptor's exposure area is the site, but what if the receptor's exposure area is smaller than site-wide? Does the FS consideration of alternatives drill down to less than site-wide exposure areas & protection at this smaller scale?

   The comparative analysis of alternatives concludes that all alternatives besides No Action are protective & meet sediment RAOs, & that the balancing factor that differentiates between alternatives is short-term effectiveness (i.e., the more you dredge the greater the detrimental impact to the environment). This is largely based on: 1) using site-wide SWACs to evaluate remedial alternatives; 2) the LWG's position that rigid containment during dredging is ineffective and potentially harmful (national examples of problematic applications are discussed in detail, but not the successful local application Arco); 3) their F&T model that predicts wide-scale natural burial; & 4) that waiting 30+ years for MNR to achieve RAOs/RGs is acceptable. Making different assumptions would likely lead to different conclusions.

3. LWG's risk-management decision to focus on 4 COCs (i.e., Bounding Chemicals) & benthic toxicity- We agree these 4 chemicals are the primary risk drivers, but they aren't the only chemicals posing unacceptable risk. There may be areas of the harbor where these 4 COCs don't exist, but other chemicals do, & those other chemicals may pose risk. This was the issue Todd King was getting to during the 7/25 EPA/partners' FS Team meeting of "circling back".
4. Engineering controls on dredging- The LWG concludes that the differential cost of engineering controls (e.g., silt curtains or rigid containment) don't provide enough control on dredging releases, resuspension, or residuals to make them worthwhile. Do we agree with this?
5. Amount of time to complete Alternatives D, E, F & G- Much of the LWG's argument for Alternative Bi is that the river will recover over time, & that alternatives that take a long time to complete aren't cost effective. Do we agree with the LWG's time estimates to complete these more aggressive alternatives (e.g., Alts D, E, & F)? Can't actions be taken to decrease the duration of some of these more aggressive alternatives?
6. Adaptive Management & Sequencing- For the purpose of sequencing, the LWG broke the harbor into 4 "Segments" (Section 7) where individual dredging "plants" could operate. DEQ prefers a "worst-first" sequencing rather than "segments". DEQ supports an "adaptive management" approach to the FS & ROD where RPs would focus on completing cleanup at the most contaminated "top-tier" group of 5-8 sites…; monitor the harbor to both verify how the system rebounds & MNR model predictions…; & then do necessary, follow-up, active remediation where needed.
7. DSL costs & agreement to allow dredging, capping, &/or CDFs/CAD facilities- Has DSL been adequately involved & provided feedback on the costs & implementation requirements for

dredging, capping, &/or construction of a CDF/CAD on State land?

8. Threshold criterion of "protection"- Throughout the draft FS, the LWG says that by either active remediation or even natural recovery processes over time…, protection will be achieved. If the LWG models are accurate, Portland Harbor sediment may recover to anthropogenic background levels (e.g., 17ppb PCBs), but that's not "protective"…, it's background. The LWG should be clearer that alternatives will generally not result in "protection", although they may well result in meeting acceptable background levels.
9. Institutional controls- Will institutional controls (e.g., no-wake zone) have adverse impact on commercial/recreational navigation, & has that been incorporated in the FS?
10. Capping effects on over river dynamics- Will multiple capping remedies adversely affect river dynamics, flood stages, &/or significantly change the models used in the FS to support MNR?
11. Comparison of alternatives- A lot of the differences between the "i" series & "r" series alternatives are due to "reduction of toxicity through treatment". The LWG argues that "treatment" includes placing a cap with amendments (i.e., GAC) on contaminated sediment. DEQ questions the high "treatment" scoring for active capping compared to dredging. It may be "active" capping, but it still capping…, which is largely containment.

    Another strong factor separating the "i" series from the "r" series alternatives is "short-term effectiveness"…, which can be thought of as short-term implementation risk. The LWG argues there's greater short-term effectiveness associated with capping than with dredging. This is because of the greater physical disturbance of sediment (causing turbidity, release, resuspension, residuals) associated with dredging than with capping. Engineering controls (e.g., silt curtains, rigid containment, etc) can increase short-term effectiveness of dredging.
12. Stranded wedges- DEQ considered a "stranded wedge" to be the soil & groundwater riverward of an upland source control measure. For instance, if an effective vertical barrier wall is installed to control an upland-sourced groundwater plume…, groundwater on the riverside of the wall is stranded & can eventually be transported to the river via diminished advection, diffusion, &/or dispersion. In their 6/7/12 memo ("*LWG Responses to DEQ's May 21,2012 Seven Concerns contained in an Email Regarding '5/10/12 DEQ/EPA/LWG Hot Spots Meeting'*"), the LWG states groundwater risks, including stranded wedges, are addressed in the FS by demonstrating how each alternative meets the 2 groundwater RAOs in combination with expected upland groundwater source controls. Do the FS alternatives adequately consider these stranded wedges?
13. ARARs- Hot Spots of contamination- Hot Spots of contamination are an important ARAR in the Portland Harbor project for DEQ. Hot Spots are addressed in several sections of Oregon Hazardous Substance Remedial Action Rules (OAR 340-122). The basic intent of Hot Spot rules is to require a **preference** (not a "requirement") for treatment of highly contaminated material or highly mobile material. As discussed in DEQ's 1998 "*Guidance for Identification of Hot Spots*", the definition of Hot Spots depends upon the environmental medium that's contaminated. For media other than water (e.g., sediment), a Hot Spot exists if the site poses an unacceptable risk (threshold criterion)…, & if the contamination is highly concentrated, highly mobile, or cannot be reliably contained.

a. Cannot be reliably contained- The FS adequately considers whether sediment contamination can be reliably contained in the effectiveness evaluation. DEQ agrees with the conclusion that sediment contamination can be reliably contained given proper design, construction, monitoring, & maintenance. Therefore, we don't believe there are sediment Hot Spots in Portland Harbor that would be defined by the "not reliably contained" criterion.
b. Highly mobile- Highly mobile Hot Spots of soil or sediment contamination are defined in OAR 340-122-0115(32) as contamination that is reasonably likely to migrate to such an extent that creates Hot Spot conditions as defined elsewhere in OAR 340-122-0115(32). The most pertinent portion of the "highly mobile" Hot Spot criterion for Portland Harbor is whether buried-sediment contamination causes a significant adverse effect on the beneficial uses of water. Specifically, whether buried-sediment contamination results in exceedances of Water Quality Criteria (chronic WQC) in either transition zone water (TZW) or surface water…, & if so, is that buried-sediment contamination a highly mobile Hot Spot?

   The LWG presents several arguments trying to either: 1) question the validity of attempting to identify highly mobile Hot Spots in buried-sediment contamination by WQC exceedances in TZW, or 2) demonstrate that there are either no areas in Portland Harbor with buried-sediment contamination that would result in TZW exceedances of chronic WQC or that if such buried-sediment contamination exists, that contamination is addressed by active remediation defined by Alternative B RALs or other more aggressive RALs.

   In their 1st argument, the LWG says there is no legal basis for applying WQC to TZW. The LWG argues that applying WQC to TZW is neither applicable nor relevant & appropriate. Furthermore, the LWG argues that DEQ's Water Quality Program doesn't apply WQC in TZW.

   In their 2nd argument (contained in a 6/14/12 Memo from the LWG to DEQ, & cc'ed to EPA titled "*Potential Hot Spot Buried Contamination Transition Zone Water (TZW) Screening Analysis*"), the LWG performed a screening analysis looking at sediment concentrations of 3 Bounding COCs (Total PCBs, BaP, & DDE) attempting to identify areas of buried-sediment contamination that could be consider highly mobile Hot Spots. Based on their screening analysis, the LWG concluded that no modeled cells (cells slightly greater than 1/10-river mile long by <100' wide) meet criteria that would cause impacts to surface sediment TZW. The LWG further argued that Alternative B (the alternative with the smallest footprint) would already contain any potential Hot Spot areas.

   DEQ doesn't agree with all of the LWG's arguments regarding highly mobile Hot Spots, but we consider the LWG's overall approach to the FS complies with the intent of our highly mobile Hot Spot rules. While highly mobile Hot Spots of buried sediment contamination may exist in Portland Harbor, their possible existence is tenuous & continuing to debate this issue using legal/policy/precedence arguments

is not the best use of project resources. Most importantly, the potential outcome of further consideration of highly mobile Hot Spots will very likely be covered in the consideration of alternatives in the Portland Harbor FS. That is, areas of significant buried-sediment contamination posing a threat to surface sediment or surface-sediment TZW will be considered for active remediation (i.e., preference for treatment).

c. Highly concentrated- **Decision-making status- Unacceptable**- Highly concentrated Hot Spots of soil or sediment contamination are defined in OAR 340-122-0115(32) as contamination exceeding risk-based concentrations corresponding to:
    i. 100 times the acceptable risk level for human exposure to each individual carcinogen;
    ii. 10 times the acceptable risk level for human exposure to each individual noncarcinogen; or
    iii. 10 times the acceptable risk level for exposure of individual ecological receptors or populations of ecological receptors to each individual hazardous substance.

The LWG concludes there are no high concentration Hot Spots in Portland Harbor. DEQ disagrees with the LWG's conclusion. At the coarsest level of analysis, the presence of product (e.g., tar & oil at Gasco) refutes the LWG's conclusion. To their credit, the LWG presents several arguments supporting their conclusions & several arguments explaining why it is difficult & problematic to attempt to identify high concentration Hot Spots. Furthermore, the LWG concludes: "*The intent of the rule is satisfied in the draft FS, because each active remedy alternative identifies the highest concentration areas & volumes & evaluates the cost-effectiveness of dredging or treating those materials*" (Section 5.5.1.1).

While the LWG's arguments have merit, DEQ is still concerned that: 1) an attempt to identify high concentration Hot Spots in Portland Harbor has not been done; 2) high concentration Hot Spots may exist in Portland Harbor; & 3) some of those Hot Spots may not be covered by active remediation included in current remedial alternatives. Here are 2 specific examples of our concerns. 1st, will the footprints of active remediation areas cover areas of highly contaminated sediment that could be consider Hot Spots? We agree with the LWG's argument that RALs identify areas of high concentration sediment contamination, but are high concentration Hot Spots larger than RAL footprints? 2nd, are there areas of high concentration Hot Spots that would be defined by chemicals other than the 4 Bounding Chemicals…, e.g., metals?

Regardless of the difficulties & problems, the LWG needs to attempt to identify high concentration Hot Spots in Portland Harbor. While the LWG's FS strategy may approach the intent of the Hot Spot rules, it does not answer the question of whether high concentration Hot Spots exist. If high concentration Hot Spots actually exist outside of areas currently designated for active remediation, then the very important state ARAR for preference for treatment will not be addressed. As we've

previously said, DEQ is willing to work with the LWG to develop a reasonable approach for identifying high concentration Hot Spots, & then participate in decisions of how to address potential Hot Spots in the FS.

14. ARARs- Hot Spots of contamination- treatment- Oregon Cleanup rules contain a preference for treatment/removal (as opposed to managing the contamination in place with engineering &/or institutional controls) of Hot Spots in soil or sediment. OAR 340-122-0115(57) defines "treatment" as a means to permanently & substantially eliminate or reduce toxicity, mobility or volume of hazardous substances with the use of either in-situ or ex-situ remedial technologies. DEQ would not consider a simple, engineered, sediment cap to be "treatment"…, at a minimum there must be some type of component to that cap that treats the contamination, otherwise it is simply containment. The LWG describes an "active" cap in Section 6.2.6 of the draft FS, & how reactive materials can be placed in a cap to supplement adsorption processes that reduce the mobility of contaminants. The LWG concludes that given the use of reactive materials, active capping represents 1 innovative form of in-situ treatment. I understand EPA supports the position that active capping can be considered treatment. However, EPA doesn't tie "treatment" to Hot Spots or their approximate equivalent, principal threat material. It's a bit of a stretch, but DEQ also supports the position in the Portland Harbor project that active capping can be considered treatment as long as it reduces the toxicity, mobility or volume of contamination. If it is simply an engineered cap (as opposed to an active cap), DEQ would not consider that engineered cap to be treatment in the preference-for-treatment component of state Hot Spot rules.

15. Infant exposure pathway- The infant breastfeeding pathway for PCBs was shown in the human health risk assessment to be the most important exposure pathway. This is inconsistently addressed in the FS. (For example, Executive Summary, Figure 3; Section 2.6.4, page 2-45, second to last paragraph; Appendix E). In addition, it is inconsistently addressed in the Risk Management document. In Table 2-1 of the risk management document, the infant exposure pathway is not recommended for consideration in the FS even though this is the most important pathway for PCB exposure. In both documents, the hazard index of 60,000 for the infant exposure pathway is sometimes omitted when the maximum hazard index is discussed. The sensitivity analysis in Appendix E of the FS does not include this important pathway. Valid decisions about the effectiveness of remedial alternatives cannot be made without considering risks to infants.

    Another deficiency of the Appendix E sensitivity analysis is that it did not include an evaluation of the most important receptor for PCB exposure, the breastfeeding infant of a mother exposed for years to PCBs in fish. A correct sensitivity evaluation would show a high probability of exceeding a hazard index of 1.

16. Noncancer risks- Noncancer risks are not discussed with the same depth and frequency as cancer risks. The most important risk at the site is noncancer effects from PCBs on infants. (For example, Executive Summary, Conclusion, ES-31, second to last bullet.) This is particularly important because whereas EPA has some flexibility in determining an

acceptable cancer risk level (1E-4 to 1E-6), the acceptable noncancer hazard index is a definitive value of 1, not a range of values.

17. Fish ingestion rates- Fish ingestion rates are incorrectly portrayed as being unrealistic and overly conservative. (For example, Executive Summary, Figure 4, showing fish consumption at 365 days/year.) This position is also inappropriately supported by the sensitivity analysis (Appendix E).

18. PCB background- Appropriate remedial goals for PCBs in sediment will be below upstream levels, which makes establishment of a PCB background level in sediment very important. The sensitivity analysis in Appendix E, Attachment 3, presents different approaches for evaluating background levels. EPA should carefully review this information because it will likely be referred to by the LWG when discussing final RGs.

19. COC terminology- Chemicals that are screened in and may potentially cause unacceptable risk are chemicals of potential concern (COPCs). Chemicals identified in the risk assessment as causing unacceptable risk are contaminants of concern (COCs). The term "COC" should not be redefined to be only those chemicals resulting in the greatest threat. (For example, Section 3.1.1.) If this concept is used, a separate term should be used. The Risk Management document also defines COC as chemicals representing primary risk (Attachment 1, Tables 4 and 13).

20. Sensitivity Analysis (human health)- **Decision-making status- Unacceptable**- The human health risk assessment sensitivity evaluation in Appendix E is seriously flawed and should not be used to inform feasibility study decisions. EPA should determine whether the sensitivity evaluation should either be performed correctly with the participation of EPA and DEQ, or the evaluation should be dropped from the FS report.

    The human health risk assessment sensitivity analysis (Appendix E) is incorrect in important elements, and therefore cannot be used to justify some statements regarding remedial goals. In the sensitivity analysis Section 3.6, the LWG makes the following statements:

    > Thus, there is scientifically defensible evidence that baseline conditions might already meet the CERCLA threshold criterion for overall protection of human health and the environment for the scenarios evaluated in the analysis. The sensitivity analysis demonstrates that RGs [remedial goals] considerably higher than EPA's point estimates of RGs … are likely to satisfy the NCP protectiveness criterion.

    Appendix E contains a flawed analysis that if done correctly would refute the above statements. The appendix is essentially a probabilistic risk assessment that was conducted without involvement of EPA and the other agencies. At the FS meeting in June 2011 when the sensitivity analysis was first presented, EPA instructed the LWG to not include the analysis in the FS because it was in effect a separate risk assessment. Oregon rules require that DEQ be consulted prior to commencing a probabilistic risk assessment (OAR 340-122-0084(5)(a)). Consulting with the agencies would have avoided the serious misconceptions

and erroneous conclusions in Appendix E.

21. Mischaracterized fish ingestion rates- A fundamental error of the Appendix E sensitivity evaluation is that the fish ingestion rates of 17.5 g/day and 142 g/day are incorrectly characterized as upper percentiles (90th and 99th) for consumers of fish (Appendix E, Table 1). As explained in the HHRA, EPA uses these values from national upper percentiles of consumers and non-consumers of fish to represent average consumption rates for actual consumers of fish. The correct interpretation of the fish ingestion rates is the following:
    - 17.5 g/day – average (50th percentile) rate for recreational consumers of fish (approximated by 90th percentile rate for consumers and non-consumers)
    - 73 g/day – upper (90th) percentile rate for recreational consumers of fish (approximated by upper percentile from Columbia Slough data)
    - 142 g/day – average (50th percentile) rate for subsistence consumers of fish (approximated by 99th percentile rate for consumers and non-consumers)

    Partly because two of the ingestion rates being evaluated are average rates, EPA instructed the LWG that fish ingestion rates should not be referred to as "high" (17.5 g/day), "higher" (73 g/day), and "highest" (142 g/day) in the HHRA document. The LWG agreed to stop using the terms, and the terms were removed from the HHRA document. However, the inappropriate characterization of rates is repeated in Appendix E (Table 1).

    In their development of national ambient water quality criteria, EPA decided to use the rates of 17.5 g/day and 142 g/day to develop recreational and subsistence values for AWQC. Because of this, EPA Region 10 and DEQ thought that using these rates would be more defensible than attempting to develop distributions of national or even regional data for application to the Portland Harbor site, particularly since fishing rates in the area are suppressed due to existing fish advisories. In the risk assessment, the goal is to characterize risks to consumers of fish; we are not interested in the risk of consuming fish to people who do not consume fish.

    The mischaracterization of fish ingestion rates as upper percentiles for fish consumers instead of median values has profound implications in a sensitivity analysis. In a probabilistic evaluation, about one half of the values are expected to be above the 50th percentile, and one half of the values below the 50th percentile. Also, one of the most important exposure parameters in the risk characterization is the fish ingestion rate. Using this information, it is immediately clear that a figure such as ES-2 in Appendix E is incorrect. Using the correct percentile with a symmetrical distribution for fish ingestion rate, the range of calculated cancer risk associated with a PCB remedial goal of 30 µg/kg (established at a 1E-04 risk level) would likely range from 1E-03 to 1E-05, rather than range from 1E-04 to 1E-06 as shown in Figure ES-2. In fact, if fish ingestion rates from EPA's exposure factors handbook or other sources are used, the distributions do not appear symmetrical (mean rates are well above median rates), and there is the potential for ingestion rates much higher than the median rate. By definition, there are no 0 g/day rates for fish consumers, and it is likely that the fish consumption rate is skewed to the right.

In addition, most consumption rates specific to fish consumers are greater than 17.5 g/day. For example, one estimate of the 50th percentile rate for consumers only of freshwater/estuarine fish is 47 g/day (EPA, *Estimated per Capita Fish Consumption in the United States*, EPA-821-C-02-003, August 2002, Section 5.2.1.1, Table 4). Because this average fish consumption rate is almost three times higher than the rate used in the HHRA for recreational fishers, it means that a probabilistic evaluation that is correctly performed will likely show that cancer risk and noncancer hazard point estimates for PCBs in sediment are underestimated rather than greatly overestimated. This would change the primary conclusion of sensitivity analysis, and could change how remedial alternatives are evaluated. The possibility that risks are underestimated needs to be a consideration in evaluating remedial alternatives.

22. Fish PRG- It is also worth noting that the sensitivity evaluation of the fish PRG based on an ingestion rate of 17.5 g/day is not a reasonable maximum exposure estimate. An RME estimate would use an upper percentile, not a median value for the fish ingestion rate, the most important exposure parameter for this pathway. EPA bases decisions at Superfund sites on RME exposure.

Specific Comments

Main Text

1. Page 2-12 and , Ecological Risk Assessment Risk Lines / Areas: The text states "*as discussed more in Section 3.1, Site contaminants currently pose potentially unacceptable risks to ecological receptors (e.g., the benthic invertebrate community and fish and wildlife populations) as detailed in the draft final BERA (Windward 2011). The primary ecological risks are from bioaccumulation of PCBs and other persistent contaminants by wildlife and their prey, which occur in addition to the direct risks to benthic communities from contaminants*." An important note is that only risk to bioaccumulation of PCBs and benthic toxicity are mention as considered in the FS. There are other risk areas that occur over a more localized scale that should be brought back into the risk assessment as indicated by comments on the BERA, and into the FS. Due to the use of a large spatial exposure scale defined by a study area to most receptors and media and the large exposure area used in the risk assessment many localized areas exhibiting unacceptable risk were dropped (e.g. lines that represent HQ>1). Examples:
    a. Surface water RAO 7 (Section 3-14): Surface water lines of evidence were inappropriately dropped in BERA (see EPA BERA comments) and need to be brought back in.

    b. Tissue Residue: Localized areas with HQ>1 should have been identified in the BERA and should be added to the FS.

2. Section 3.5, PRGs and Proposed RGs: The text states "*the draft FS addresses all contaminants posing potentially unacceptable risk as identified in the baseline risk assessments as well as contaminants yielded from the EPA-required additional water screening steps described in Section 3.1*." This statement is not accurate in terms of the ecological risk assessment. Not all contaminants posing potentially unacceptable risk

were identified in the BERA and therefore are not contained in the FS.

a. Section 3.5.1: The text states "*sediment PRGs were provided by EPA (EPA 2008b; Windward et.al. 2009). All of the PRGs developed for the draft FS, consistent with the most recent revisions of the risk assessment as well as a description of methods to calculate the PRGs, are presented in Appendix Da.*" Have these been reviewed by EPA? Based on the comments on the BERA, the PRGs will likely need to be re-evaluated. **See Appendix Da, Sections 2.0 and 3.0 – these need to be reviewed for consistency with the ecological and human health risk assessments.** These are some preliminary concerns:

   i. Problem formulation states BSAFs should have been developed for chemicals included in the food web model (e.g. PCBs, dioxins and DDX compounds) . This analysis should have been included here, especially since some areas of concern represent localized areas (non-site wide).

   ii. PRGs for sculpin should be 0.1 mile of linear shoreline and not a centroid. This approach places too much emphasis on deeper water exposure that has not shown to correlate with sculpin habitat.

   iii. PRGs were developed using data from both sides of the river for smallmouth bass in 1 mile increments. This should be revised to include 1-mile segments restricted to one side of the river or the other. This approach dilutes exposure that occurs primarily from one side of the river. Additionally, the text states "*because it was unknown whether the smallmouth bass might forage upstream or downstream from where they were collected, 1 RM exposure areas at 0.1-mile increments were evaluated ranging from 1 mile upstream to 1 mile downstream of the collection location of each smallmouth bass in a given composite.*" This results in a 2-mile sediment SWAC used for exposure for one smallmouth bass. This should be refined to only include the 1 river-mile exposure based on the composite collection location.

   iv. The text states "*the sediment data used to generate SWACs were based on the BERA dataset, which included a subset of data from the site characterization and risk assessment (SCRA) database*." It is not clear why the dataset used to calculated appropriate SWACs for bioaccumulation modeling would be different than the SCRA database. The BERA dataset would presumably be much more limited to co-located tissue and bioassay stations.

3. Section 3.5.2.2 Comprehensive Benthic Risk Approach for Benthic Focused PRGs: The text states "*bioassays cannot form the primary LOE for the draft FS analysis of alternatives because the analysis is of potential future conditions and future bioassay results after remediation cannot be easily predicted, if at all. Therefore, the sediment chemistry LOE, as applied in the comprehensive benthic approach, is used in the draft FS to judge protectiveness of potential remedies for the benthic invertebrate community*."

Do to the uncertainties outlined with the use of the predictive models (FPM and LRM), the strong recommendation from the ecological risk assessment review is to use **bioassays as the primary line of evidence and for the determination of protectiveness after remediation.**

4. Section 3.6.1 and Appendix E, Attachment 1A, Ecological RG: The sensitivity analysis of the PCB RG and BERA assumptions about exposure, toxicity, were examined using input parameters that were not a part of the BERA. For example, the risk model was completely different including a new terrestrial prey component for the mink diet. The use of completely different assumptions from the risk assessment is inappropriate. Terrestrial diet should be removed for the analysis based on prior agreements bifurcating the terrestrial and in-water assessments, and in order to be protective of other piscivorous mammals.
    b. Preliminary comments on Mink Model ***Needs further review:
        v. Model itself has not been reviewed and is not a part of the BERA.

        vi. Use of terrestrial prey should be removed. This assumption in of itself significantly reduces risk estimates.

        vii. Relative abundance estimates used as an exposure parameter based only on what and how many were caught should be re-considered. There were many deficiencies in LWG sampling, especially in early rounds where a higher diversity of fish were targeted. Given electroshocking was the primary collection technique, many deep water fish were likely missed (range of 10 ft. depth).

        viii. Habitat model should be reviewed by USFWS

Appendix Da: This is going to take some time to review (see above comment) and EPA might want to consider an outside review that has access to the site-specific database.

Appendix P, Comprehensive Benthic Approach:

1. Toxicity or "Hit" Definition: The text states "*the sediment toxicity LOE will include level 2 (moderate) and level 3 (severe) effects for all four endpoints (chironomus [sic] biomass and mortality and hyalella [sic] biomass and mortality*)." This results in **an average exceedance factor** and does not consider the effects on that might occur in one organism but not the other or in one endpoint (biomass and survival) but not the other. In other frameworks this has been termed a "one hit / two hit" interpretation as termed the Army Corps Dredge Framework. This approach has been consistently rejected on this project as an appropriate determination of risk. A "hit" should be defined as a level 2 or greater hit in either bioassay.

   In addition, it appears that the one hit / two hit criteria are used in the FS across all 4 endpoints, including biomass, as indicated above. Since biomass considers both survival and growth in one endpoint, a hit in biomass should be considered a hit for that

organism. Using the proposed methodology, a hit would have to be seen in both biomass and survival to constitute a hit. The bottom line is that a hit in any of the four endpoints should be considered hit significant enough to be brought into the FS.

The two test organisms respond differently to different contaminants and it should not be required that both organisms respond to indicate a level of toxicity that should be evaluated in the FS.

2. Toxicity Predictions using Mean Quotient: The floating point model SQVs should not be used within a mean-quotient framework. As the BERA states (Page 175), the set of SQVs from the floating point model are not independent and therefore individual SQVs cannot be pulled out and used alone to predict toxicity.

   "*Once that set is determined, the SQVs must be used together to predict the toxicity of the contaminant mixture—they are not independent. Each SQV explains toxicity along with all the other SQVs that were derived from the model except for SQVs that were set equal to the maximum concentration in the dataset (because these SQVs do not define the onset of toxicity*." BERA, 7/2011.

   Further, the use of select dependent SQVs in a mean-quotient approach is not consistent with the development of the SQV set and floating point model. Instead, toxicity should be predicted using the set of SQVs to evaluate sediment chemistry at a given location. If any chemical SQV in the set is above the criteria, toxicity is predicted. It is also important to recognize that national SQGs from which the methodology was developed ***does utilize independent SQGs***, and therefore the mean quotient can be applied as was outlined in EPA's Problem Formulation.

3. Mapping of Benthic Risk Areas: In the FS, comprehensive benthic risk areas were identified based on the LWG's application of the comprehensive benthic approach with the above problems. Maps should be re-done for both the draft BERA (Maps 12-1a and 12-1b) and Attachment 1 of this draft FS.

4. Page 6, Two or More Adjacent Station Requirement: The text states "*comprehensive benthic risk areas were identified where two or more adjacent sampling locations indicated potentially unacceptable risk to the benthic community based on either empirical or predicted toxicity, empirical or predicted bioaccumulation, empirical TZW chemistry, or a combination of bioassay and chemistry LOEs*." The particulars of this analysis are not detailed, and it is not clear if this requirement is that each pair of "either or" are required to be exhibited in two or more adjacent sampling locations. If so, this is an unnecessarily restrictive requirement.

5. Page 6, Benthic Model (FPM / LRM) Decision Criteria for Toxicity Designations: The FS requires that sampling locations where **both the MQ and pMax thresholds** were exceeded were considered toxic. Therefore, deficiencies in the approach using the floating percentile model with mean quotients are not covered by the use of the logistic regression model. Even more alarming, sampling locations where **neither the MQ nor**

pMax threshold was exceeded were considered non-toxic. This is not consistent with designations of the risk assessment and definitions of toxicity (EPA Problem Formulation). Furthermore, Appendix Da which discusses PRG development, states "***the MQ threshold was used as the sole benthic PRG because of difficulties inherent in using the pMax as a PRG***." Due to the problems outlined with the floating percentile model and the use of the mean-quotient threshold (MQ), other methods should have been used for PRG development which should include the pMax model (concerns outlined here don't seem valid) or the floating point SQVs as a set instead of using the MQ analysis.

6. Transition Zone Water Line of Evidence: Only TZW exceedance areas with hazard quotients (HQs) greater than 100 were delineated (see Section 12.2 of the draft final BERA for derivation of this factor). **TZW that exceed risk values in water (HQ>1 should be delineated).**

7. Page 7, Table 2, Results: This table needs to be done incorporating the comments on the comprehensive benthic approach.

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